August 12, 2005

Mr. Barry Zimmer
Federal Highway Administration
Office of Operations Technology Services, HOST-1
400 Seventh Street, S.W., Room 3404
Washington, DC 20590

Re: *Recovery and Redundancy of Transportation Management Centers*
Task Order No. CA81B076
Contract No. DTFH61-01-C-00181

Dear Mr. Zimmer:

Cambridge Systematics, Inc., in association with PB Farradyne, is pleased to provide this submittal to the Federal Highway Administration (FHWA) in response to the Task Order Proposal Request (TOPR) CA81B076 titled *Recovery and Redundancy of Transportation Management Centers*. A signed original plus one copy will be delivered to Barbara McClary. An additional copy will be delivered to Raj Ghaman, the Contracting Officer's Task Manager (COTM). The proposal also is being submitted electronically to Ms. McClary, Mr. Ghaman, Carl Rodriguez, and you as a Microsoft Word file. This proposal is valid for a period of 90 days from the date of this letter.

Introduction

Whether managing day-to-day transportation or taking proactive steps to facilitate transportation during significant events such as those taken by local agencies in the Washington, D.C. region on 9/11, it is clear that Transportation Management Centers (TMC) are a critical part of the transportation infrastructure. It's no coincidence that the Montgomery County, Maryland, County Executive took immediate and decisive action shortly after 9/11 to co-locate the County's TMC with the County's police, fire, and emergency medical services dispatch operations and the County's Emergency Operations Center.

The events of 9/11 provide an example of a catastrophic incident that could paralyze or even destroy a TMC such as what became of one of the Port Authority of New York and New Jersey's TMCs in the basement of one of the World Trade Center buildings. Many TMCs around the country are the focal point for an organization's transportation operations. If they are disabled, paralyzed, or temporarily shutdown, then they become ineffective and the traveling public can pay a terrible price. Hence, there is need to examine methods to provide TMC recovery and redundancy.

Unfortunately, catastrophic events may come in an indefinite number of combinations and permutations. Rather than trying to identify each type of catastrophic event, it is more effective to identify one or several of the underlying issues to which the event fits. The underlying issues

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are common in many of the mitigation and recovery methods utilized in other industries, such as the banking industry, and include:

- Loss of infrastructure such as the loss of the building, utilities, and/or communications. The loss of infrastructure may be characterized as a "physical loss" resulting from a fire or explosion, or a "non-physical loss" resulting from occurrences such as contamination, riot, and destruction of roads leading to the facility. The loss of infrastructure worst-case scenario would require a complete relocation of the facility, and the need to obtain new equipment and data. Planning for the worst case allows one to migrate in the case of less than a worst-case scenario. A temporary loss of infrastructure or a loss of a portion of the infrastructure may be handled through taking less drastic measures than a full relocation.

- Loss of key personnel such as the loss or inaccessibility of key member(s) of the operational team. The loss of key personnel may be due to such things as sickness, epidemic, employment action, or disasters where a large number of people are hurt. If combined with the loss of the TMC building infrastructure, the loss of key personnel would further exacerbate the ability of a TMC to properly function. Planning for the worst-case scenario would include being able to run the operation with none of the key personnel available. As such, documentation of operational procedures and existing systems is a key to providing recovery and redundancy capabilities to combat a loss of personnel. Additionally, cross-training of staff with different responsibilities will help mitigate this type of risk.

- Loss of systems that are key to the operations of the TMC. Causes of this type of loss include such occurrences as loss of hardware that run the systems, upgrades of operating systems components that have an adverse effect on the system, unique occurrences such as Y2K, and errors caused by embittered employees. Again, this may occur along with other listed issues, but have their own mitigations and recovery issues.

- Community-wide disaster such as situations that affect the community as a whole. These may be civil emergencies, flooding, or weather emergencies. In these cases, the TMC is affected by being within the community. The situation may be in the community in which the TMC resides, or a community that is near the TMC and is home to the stakeholders of the TMC. Part of the planning may include a change in responsibility and volume of data being received because of the emergency, or combination with other issues such as loss of key personnel.

Mitigation is the key to keeping a TMC fully functional. When factors occur that would normally lead to a catastrophic event, it is best to have the risk mitigations in place to lessen the impact. TMC risk mitigation includes many different possibilities for which planning should occur within a TMC. Development of mitigation strategies should include a review of a typical TMC's single point of failure. Mitigation strategies can be characterized as follows:

- Redundancy of staff, central systems, field devices, and communications infrastructure;
- Documentation of standard operating procedures and emergency operating procedures;

- Testing of back-up systems, operational procedures, drills, and table top exercises; and
- Security for both physical and data.

For the case where mitigations do not fully protect the TMC from catastrophic events, plans must be formulated to address the appropriate level of recovery for each level of each of the issues listed above. The plans must take into account the cost/benefit of the solution, the amount of time that the TMC or individual functions are allowed to be inactive after a catastrophic event, alternative methods of delivering the service, and the like. The deployment and applicability of the worst-case plan must be tested and retested in order to ensure that at any point the TMC is ready to execute the plan.

For this project, PB Farradyne will review possible mitigations that will enable these events not to impact a TMC catastrophically. In the case where the results are catastrophic, PB Farradyne will review TMC recovery methods to reduce the adverse effects to a minimum.

Technical Approach

The objective of this project is to develop a technical document that provides guidance and recommended practices on how to plan, initiate, develop, and implement recovery and redundancy plans for TMCs. There is a need for detailed information and guidance on what recovery and redundancy are, why they are important, and how they should be implemented. PB Farradyne's technical approach is summarized in the following tasks.

The scope of the Task Order requires a mix of skills. PB Farradyne proposes the use of a range of technical staff with expertise in all facets of a TMC, ranging from staffing and operations to communications to the cybersecurity aspects of firmware, software, hardware, and system integration. PB Farradyne will also bring staff to the project with breadth and depth of experience with the types of intelligent transportation systems (ITS) deployed in TMCs by public agencies including traffic signal systems, freeway management systems, Surveillance Control and Data Acquisition (SCADA) systems typically deployed for control of tunnel devices, and regional information exchange and sharing systems.

Task A: Annotated Outline, References, and Work Plan

Task A.1 – Kickoff Meeting

PB Farradyne's Project Manager and Technical Director will attend a project kickoff meeting with the COTM. At the project kickoff meeting, PB Farradyne will:

- Review the proposed approach, staffing assignments, key issues, and critical path project elements related to completing the literature review, assessment of current practices, annotated outline, development of the technical document, and distribution plan and outreach

materials. A formal Microsoft PowerPoint presentation will be made to the COTM. Meeting minutes will be documented and distributed. As appropriate, issues discussed at the project kickoff meeting will be used to revise the project plan and detailed project timeline.

- Review the project fact sheet. The project fact sheet is anticipated to include, but not necessarily be limited to, the project's purpose and need, expected influence within the practice, key technical topics and cross-cutting issues to be addressed by the project, and key milestones, deliverables, and points of contact. PB Farradyne will develop and submit a two-page project fact sheet prior to the project kickoff meeting. A revised project fact sheet will be resubmitted to the COTM following incorporation of comments at the project kickoff meeting.

- Review procedures for coordinating with the TMC Pooled Fund Study (PFS) Support Contractor, and obtain timely input, review comments, and guidance from participating TMC PFS members and other interested practitioners such as the Institute of Transportation Engineers (ITE) TMC and Traffic Incident Management Committees and the Transportation Research Board (TRB) Freeway Operations, Traffic Signal Systems, and High-Occupancy Vehicle (HOV) Systems Committees. PB Farradyne will review all feedback, integrate the comments into one complete and representative document, and recommend to the COTM what comments are to be incorporated into the project. All correspondence with the TMC PFS members will be electronic –no meetings are anticipated or have been scoped.

Task A.2 –List of References and Work Plan

In this subtask, PB Farradyne will apply our staff knowledge, undertake literature research, conduct on-site interviews to expand the input and knowledge base of TMC redundancy and recovery issues and practices, and develop a detailed work plan.

The purpose of the literature search and on-site interviews will be to identify:

- Written TMC recovery and redundancy practices;

- Gaps in available literature resources and the need for what type of additional information (as discussed later in this task, PB Farradyne will obtain additional information to fill identified gaps though interviews);

- Lessons learned;

- Identify issues and summarize methods and procedures for initiating, developing, and maintaining recovery plans; and

- Identify issues and methods for planning, design, and implementing TMC recovery and redundancy.

While recovery and redundancy represent an increasingly important issue, literature and information on TMC recovery and redundancy practices to date is limited. PB Farradyne will focus on identifying reports that address TMC recovery and redundancy issues related to the loss of key personnel, infrastructure, systems, and civil/weather emergences that may impact the TMC. PB Farradyne will provide a list of references, complete with a three- to four-sentence description, to the FHWA for review and approval. PB Farradyne's initial literature search will be conducted according to the FHWA's feedback. PB Farradyne also believes it would be helpful to review reports associated with the sites we visit later in this task and we will seek these reports as part of the process of setting up the site visits.

We will gather information from a range of sources that relate to the subject more generally, to sources relating to specific technical areas such as cybersecurity as well as transportation and non-transportation organizations. Cyberattacks include those that may specifically be waged against software systems. Software components are fundamental to TMCs and ITS systems. In fact, many ITS systems such as freeway management systems, traffic signal systems, and regional information sharing systems may be completely software based. Attacks on software have the possibility of altering what the system and personnel believe is the state of the system and can be easily launched from a laptop computer that is connected into the Internet through WiFi or cell phone carriers. Examples of literature sources we will review include:

- (Cybersecurity) Verton, Dan, "Black Ice: The Invisible Threat of Cyber-Terrorism," McGraw-Hill, 2003.
- National Infrastructure Protection Center documentation.
- *Critical Foundations: Protecting America's Infrastructure*, the Report of the President's Commission on Critical Infrastructure Protection (October 1997).
- (Cybersecurity) "Utility Companies Face Barrage of Cyberattacks," *Computerworld* (January 21, 2002).
- *Information Sharing for Critical Infrastructure Protection*, Task Force Report of the President's National Security Telecommunications Advisory Council (June 2001).
- *Integration of ITS with Security Systems in a Multimodal Environment*, Port Authority of New York and New Jersey, http://security.transportation.org/doc/Integration_ITS_Security.pdf.
- *Effects of Catastrophic Events on Transportation System Management and Operations: August 2003 Northeast Blackout, Great Lakes Region*, U.S. Department of Transportation and John A. Volpe National Transportation Systems Center, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14021.pdf.
- *Effects of Catastrophic Events on Transportation System Management and Operations: August 2003 Northeast Blackout, New York City*, U.S. Department of Transportation and John A. Volpe National Transportation Systems Center, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14023.pdf.

In order to further understand and increase the project knowledge base on TMC recovery and redundancy practices and issues, interviews will be held with selected TMC facilities that have experienced the loss or degradation of their TMCs due to the loss of key personnel, infrastructure, systems, or civil/weather emergencies. A draft list of 10 command and control center possible sites (a mix of both TMCs as well as non-transportation centers) will be generated along with a draft list of questions that will be asked of the TMC operating agencies and delivered to the FHWA for comment. We anticipate the sites will include agencies that have experienced recent events impacting TMC recovery and redundancy issues including terrorist attacks, hurricanes, earthquakes, winter weather, etc. A number of these sites include ITS systems and TMCs that were designed or are being operated or maintained by PB Farradyne. Potential sites include:

- New York City Metropolitan Area – PB Farradyne designed, developed, and is currently enhancing the TRANSCOM Regional Architecture system, and is operating the New York City Joint Operations Center.

- Washington, D.C. Metropolitan Area – PB Farradyne developed the Maryland State Highway Administration's (SHA) Coordinated Highways Action Response Team (CHART) statewide transportation management software and the Northern Virginia District's traffic signal control system, and is maintaining Northern Virginia's freeway management system.

- Maryland Homeland Security Fusion Center – PB Farradyne was not involved in the design, creation, or operation of this facility. However, due to the close vicinity and the fact that the Pentagon considers this facility to be one of the most advanced Fusion Centers in the country, it is important to consider and integrate any TMC recovery and redundancy functions.

- Florida – PB Farradyne designed, deployed, and is currently operating the Palm Beach Interim Traffic Control System. PB Farradyne is also developing several modules of the Florida Department of Transportation's (DOT) statewide transportation management system software, and is engaged in incident response planning throughout the State.

- San Francisco Bay Area – PB Farradyne designed, deployed, and is currently operating and maintaining the region's 511 travel information system, and we were recently selected to deploy a video surveillance system for the California DOT (Caltrans) District 4 and a signal system for the City of San Francisco.

- Louisiana – PB Farradyne planned, designed, and is now deploying transportation management systems in Baton Rouge, New Orleans, and other areas in the State. The use of the system during hurricane evacuations was a prime consideration.

- Kentucky – PB Farradyne planned, designed, and integrated a statewide Transportation Operations Center (TOC) for the Kentucky Transportation Cabinet (KYTC). PB Farradyne has also been tasked to design the physical elements of the Kentucky Office of Homeland Security's Fusion Center that will be co-located with the statewide TOC.

We also recommend visiting sites where winter storms frequently cause a disaster such as in Minnesota, Montana/Wyoming, or New England, or the sites of participating TMC PFS members.

We will use the recent experience gained through our national incident management assignments to identify possible sites. Our incident management experts have a wide variety of contacts with police and emergency response agencies who work closely with transportation officials in planning for recovery and redundancy of TMCs and their operations. If so desired by the FHWA, we will also use the experience of Douglas Ham. Mr. Ham has been engaged in several efforts with the American Association of State Highway and Transportation Officials (AASHTO) relating to the subject of security-related vulnerability assessments and emergency management and can further advise the FHWA on potential sites.

In addition, if so desired by the FHWA, we will work with Harry Saporta, a colleague in PB Transit and Rail, to identify possible interviewees that would provide a public transportation perspective, especially related to light rail or mass transit TMCs. PB is one of the world's leading public transportation system designers, with contacts throughout the industry. Prior to joining Parsons Brinckerhoff in 2003, Mr. Saporta served as the Federal Transit Administration's (FTA) Director of Safety and Security where he was responsible for developing safety and security programs to meet the safety, homeland, and transit security needs of the transit industry throughout the United States. In the wake of the events of 9/11, he developed and implemented the Five Point Homeland Security Program that provided a strategic plan for combating potential acts of terrorism against transit agencies.

We plan to have Donald Correll lead all of the site visits with support from appropriate technical staff. Having one person conducting the on-site interviews of all of the agencies will result in consistency of questioning and interpretation of answers. Mr. Correll is a veteran engineer with years of system experience relating to threats and mitigations (see his biographical description later in the proposal). He is an outgoing conversationalist who we believe will be able to easily engage interviewees in meaningful dialog.

Having one person leading the on-site interviews will require more time for the interview process than if we conducted the interviews using multiple staff in parallel but we believe that Mr. Correll is the right person and that this is the best way to conduct this portion of the project. If this causes schedule or budget concern to the FHWA, we are able and are willing to discuss using comparably priced staff from our offices across the country to do interviews in parallel with Mr. Correll.

As the interviews proceed, we will add questions on issues identified in earlier interviews. We will prepare a set of notes immediately following each interview, gather any follow-up information from the sites in response to comments from the FHWA, and amend the interview notes accordingly.

We plan to pose open-ended questions that will provoke thought and follow-up discussion. Examples of the types of questions that may be asked are:

- What do you feel are the most important recovery issues and redundancy functions of a TMC?
- Are there TMC functions that your organization would need in the case of a failure that are not needed on a day-to-day basis?
- What are the main threats that concern your organization that affect your ability to provide TMC recovery and redundancy capabilities?
- What support does your agency require of infrastructure providers (electric, phone, on-street hardware, etc.) to support TMC recovery and redundancy capabilities?

We will submit a draft list of sites and questions to the FHWA, modify them according to the FHWA's feedback, and conduct interviews accordingly.

Task A.3 – Annotated Outline

PB Farradyne will prepare an annotated outline that will serve as the basis from which the Task B technical document will be developed. The outline will:

- Reflect information obtained through PB Farradyne's literature search and interviews.
- Define and discuss the concepts of TMC recovery and redundancy, and why they are necessary.
- Clearly synthesize current practices and lessons learned related to TMC recovery and redundancy.
- Address how the TMC redundancy issue could impact the operation of other regional systems and / or operations.
- Clearly describe the intended purpose and structure of each chapter.
- Provide the foundation, context, and framework for the subject matter, key technical topics, and associated issues related to TMC recovery and redundancy that will be included in the technical document.

- Address TMC recovery and redundancy in four areas –the loss of key personnel, infrastructure (e.g., communications, power, building), systems (e.g., hardware and software), and civil / weather events (e.g., hurricane, tornado, snow, and ice) that can impact a TMC. Specific issues to be addressed include:
  - Issues and methods for the planning, design, development, and implementation of TMC recovery and redundancy;
  - Needs assessment and prioritization;
  - Determination of tolerance and "down time" thresholds;
  - Evacuation plan considerations on TMC recovery and redundancy requirements;
  - Recommended mitigation measures for the loss of personnel, infrastructure, systems, and civil / weather events;
  - The merit of tabletop exercises;
  - The need for additional research, training, or technology transfer initiatives;
  - The development of a TMC recovery checklist; and
  - Funding.

PB Farradyne will prepare initial, draft, and final "working version" annotated outlines for the purpose of allowing staff and the COTM to focus and agree on the key messages, themes, organization, content, and how best to format and present the subject matter prior the development of a draft report. PB Farradyne's approach is as follows:

- The initial annotated outline will focus on presenting high-level issues, key components, themes, messages, chapter and section organization, and justification and focus of the report;
- The draft annotated outline will address and incorporate comments to the initial outline, and contain a sufficient level of detail that would be expected of a final outline; and
- The final annotated outline will address and incorporate comments of the draft outline.

Deliverables

- Project kickoff meeting presentation, minutes, and project fact sheet;
- List of technical references;

- Detailed work plan that sets forth PB Farradyne's approach to collecting additional information not readily documented in literature; and

- Initial, draft, and final annotated outlines that will serve as the basis for the development of the Task B technical document.

Task B: Produce Technical Document

Task B.1 – Technical Document Mockups

PB Farradyne will prepare three technical document mockups to demonstrate alternative methods of presenting the technical information that will include but not necessarily be limited to:

- Different page layouts;

- Reference and cross reference methods and styles;

- Indexing;

- Use of color;

- Presentation of key information through the use of checklists, highlighting successful and best practices, and emphasizing key points; and

- Layout and access issues associated with printed and electronic versions of the technical document.

Task B.2 – Draft Technical Document

PB Farradyne will develop a draft technical document that is responsive to the final annotated outline and additional direction provided by the COTM, if necessary. Chapters will be incrementally submitted to the COTM for review for the purpose of obtaining initial feedback early in the technical document development process. We anticipate making ample use of photographs, charts, tables, graphics, etc., to make for a more interesting report. Our writing style will be concise and devoid of unnecessary background information. The report will also include an Executive Summary that will list and very briefly describe the key issues and findings.

The audience for the technical report is anticipated to include state DOTs, metropolitan planning organizations (MPO), transit agencies, enforcement agencies, and others that may have a role in a TMC. Specific end users of the technical report are anticipated to include TMC managers, first-level supervisors, and technical staff involved in the operations and management of the transportation system.

PB Farradyne's focus will be on identifying and recommending practical solutions that will easily enhance TMC recovery and redundancy issues. The following examples illustrate the types of recommendations we anticipate making:

- Allow for moving termination of phone lines to alternative sites;
- Install dial-back system on dial-in network;
- Mount on-road hardware at a level above possible water levels;
- Provide for alternative power supplies (generator, solar cells);
- Provide for alternative phone network (cell phone, WiFi); and
- Warehouse alternative on-street hardware for temporary placement.

As a further illustration, consider the following excerpts from a report prepared by Virginia DOT personnel in the aftermath of the 9/11 attack on the Pentagon. They point to various very practical mitigation measures, many of which are operations and recovery oriented. PB Farradyne believes it is imperative that we give operations solutions of this type due attention:

- For external communications, the Virginia DOT will need to rely on the use of more specialized, leased two-way and satellite-type communication devices;
- The Virginia DOT needs to have appropriate teleconferencing equipment exclusively dedicated for this sensitive traffic operation center;
- Within the framework of managing incidents and emergencies of this magnitude and nature, the Virginia DOT needs interoperability guidelines for contact and interaction with the military;
- A centralized, unified district emergency command facility (information and command center) would encompass all Virginia DOT sections, police, fire and rescue, council of governments (COG), and others;
- Visual verification of traffic flow and patterns to confirm proper incident management signal plans are adequate for the emergency; and
- Establish protocol for providing and obtaining additional resources (equipment, signs, light towers, or manpower) from neighboring states or jurisdictions.

As an integral part of the draft technical document, we anticipate preparation of a table that ties together the work produced up to this point. A very brief excerpt of the table we envision is shown below.

Table 1. System Assessment

System Type	Characterization	Threat	Impact	Mitigation
Signals	Dial-up network	Unauthorized person dialing into network	System running with unauthorized data	Password protection Dial-back service

Task B.3 –Final Technical Document

PB Farradyne will prepare a final technical document that fully addresses and incorporates comments to the draft technical document.

Cambridge Systematics has been providing comprehensive development support for Section 508 to our Federal clients since June 2001. This support includes planning, design, production, and maintenance of all electronic publication materials including web-based Intranet and Internet information.

Cambridge Systematics has staff that are trained in Section 508 compliance requirements and guidelines as are outlined in the Electronic and Information Technology Standards, Subpart B, Section 1194.22 (Web-based Intranet and Internet information and applications); Section 1194.24 (Video and multimedia products); and 1194.25 (Self-contained, closed products). We are experienced in reworking existing publications and web sites to meet Section 508 compliance requirements, as well as developing electronic publications and web sites from inception to meet the requirements. We also have experience in the requirements and writing style of descriptive alternative text and table summaries to add to the effectiveness of the compliance.

Cambridge Systematics' staff utilizes the following software in this effort:

- HTML coding;
- Microsoft FrontPage;
- Microsoft Word 2000;
- Microsoft PowerPoint 2000;
- Adobe Acrobat 5; and
- Adobe Photoshop 7.

Deliverables

- Three technical document mockups;
- Draft technical document; and
- Final technical document.

Task C: Outreach Material and Distribution Plan

Task C.1 – Project Fact Sheet and Presentations

PB Farradyne will prepare a project fact sheet for use by the COTM and TMC PFS members throughout the course of the project. The project fact sheet shall:

- Summarize the purpose, benefits, key aspects, and best practices related to TMC recovery and redundancy;
- Be consistent with the annotated outlines and the draft and final technical documents, and updated throughout the course of the project as necessary; and
- Be geared towards individuals responsible for the planning, design, operation, or maintenance of a TMC.

PB Farradyne will also prepare Microsoft PowerPoint project and subject presentations, and update them throughout the course of the project as necessary. The project presentation will include speaker notes, and will summarize issues, challenges, purpose, expected outcome, findings, and schedule in an approximately 15-minute overview for a general audience. The subject presentation will provide a more detailed explanation of the technical document's subject matter and will be designed to be an approximately 30- to 40-minute presentation. The intended audience is executives, managers, and technical staff that may be involved in the setting of policies, allocating resources, training, and operations of a TMC.

Task C.2 – Distribution Plan

PB Farradyne will develop a distribution plan to raise the level of awareness on the availability of the final technical document. Distribution channels to be researched are expected to include the FHWA Resource Centers, FHWA Division Offices, electronic notice to the TMC profession, and provide a distribution list of agencies, organizations, and web sites.

Deliverables

- Project fact sheet;
- Project presentations;

- Subject presentations; and
- Distribution plan.

Schedule

Task	Completion Date
Task A.1 – Submit Project Fact Sheet	14 days after Notice to Proceed (NTP)
Task A.1 – Project Kickoff Meeting	21 days after NTP
Task A.2 – Submit List of References and Work Plan	21 days after NTP
Task A.2 – Conference Call to Discuss List of References and Work Plan	45 days after NTP
Task A.3 – Submit Initial Annotated Outline	45 days after NTP
Task A.3 – COTM Comments to Initial Annotated Outline	59 days after NTP
Task A.3 – Submit Draft Annotated Outline	75 days after NTP
Task A.3 – COTM Comments to Draft Annotated Outline	96 days after NTP
Task A.3 – Submit Final Annotated Outline	120 days after NTP
Task A.3 – COTM Comments to Final Annotated Outline	141 days after NTP
Task B.1 – Submit Technical Document Mockups	180 days after NTP
Task B.1 – COTM Comments to Technical Document Markups	194 days after NTP
Task B.2 – Submit Draft Technical Document	270 days after NTP
Task B.2 – COTM Comments to Draft Technical Comments	291 days after NTP
Task B.2 – Complete Draft Technical Document	330 days after NTP
Task B.3 – Submit Final Technical Document	390 days after NTP
Task C.1 – Submit Revised Project Fact Sheet	405 days after NTP
Task C.2 – Submit Draft Project and Subject Presentations	405 days after NTP
Task B.3 – COTM Comments to Final Technical Document	411 days after NTP
Task C.1 – COTM Comments to Revised Project Fact Sheet	426 days after NTP
Task C.2 – COTM Comments to Draft Project and Subject Presentations	426 days after NTP
Task B.3 – Re-Submit Final Technical Document	432 days after NTP
Task C.1 – Submit Final Project Fact Sheet	447 days after NTP
Task C.2 – Submit Final Project and Subject Presentations	447 days after NTP

Staffing Plan

Table 2 presents the staffing table for the task.

Table 2. Staff Hours by Task

Personnel	Organization	Task A	Task B	Task C	Total
Jeffrey Arch	PB Farradyne	200	56	24	280
Andrew Iserson	PB Farradyne	40	80	4	124
Cary Vick	PB Farradyne	32	40	4	76
Joerg "Nu" Rosenbohm	PB Farradyne	98	40	4	142
Donald Correll	PB Farradyne	98	40	4	142
Robert Murphy	PB Farradyne	32	24	0	56
Cliff Conklin	PB Farradyne	32	24	0	56
David Howell	PB Farradyne	32	24	0	56
Vijay Varadarajan	PB Farradyne	176	224	0	400
Susan Armstrong	PB Farradyne	182	224	40	446
Annie Amato	PB Farradyne	80	0	0	80
Neil Dugas	Cambridge Systematics	0	80	0	80
William McKee	Cambridge Systematics	0	80	0	80
Totals		1,002	936	80	2,018

Jeffrey Arch will be the Project Manager for this task. Mr. Arch is an Assistant Vice President with PB Farradyne, a District of Parsons Brinckerhoff Quade & Douglas, Inc., who possesses a diverse background in ITS, traffic engineering, and project management. Mr. Arch is currently the project manager for the planning, design, procurement, installation, integration, and testing for hardware, software, and a communications infrastructure for a new statewide TOC in Frankfort, Kentucky. The $6.3 million project will house:

- Traffic signal and incident management subsystems;
- Video control and a video sharing subsystem with four regional operations centers in Louisville, Cincinnati, Lexington, and the Cumberland Gap Tunnel area and selected KYTC Districts;
- Vehicle enforcement communications system;
- Safety service patrol communications system;

- The Office of Homeland Security's statewide Fusion Center for the purpose of collecting, analyzing, fusing, and sharing security-related information;

- Ten operator workstations; and

- Statewide snow and ice removal operations and their supporting systems.

Andrew Iserson will be the Technical Director for this task. Mr. Iserson is the Director of Software Development for PB Farradyne. He possesses more than two decades of experience in the information systems industry, including 20 years managing state-of-the-art software and systems development departments responsible for corporate-level computer systems analysis, design, programming, testing, project management, disaster recovery planning, and quality control. Mr. Iserson's experience in designing, programming, and managing technologies include various computer operating systems, languages, database management systems, and communications architectures.

Before joining PB Farradyne, Mr. Iserson served as the Vice President and Manager of Information Systems Development at Chevy Chase Bank, where he was responsible for the systems design and management of the corporate systems development division consisting of up to 80 information systems professionals. In this role, Mr. Iserson managed and oversaw the implementation and testing of a Disaster Recovery Plan for a $10 billion regional bank. The plan included mainframe, personal computer (PC), automated teller machines (ATM), and banking hardware platforms as well as a significant interstate network that was re-directed to a back-up site. Items that were maintained included the movement, relocation, and re-purchase of hardware, software, and staff as necessary. Procedures for declaration and proper notifications also were included. These processes and procedures were tested quarterly under the control of auditors. Mr. Iserson was a member of a Disaster Recovery team that moved all corporate applications and networking to a hot disaster site as a result of a declared disaster. He also negotiated set-up, interfaces, and contract terms with a hot site provider.

Cary Vick has more than 28 years of experience and is an industry expert in the design, implementation, and evaluation of Advanced Traffic Management Systems (ATMS), computerized traffic control systems, traffic volume monitoring systems, and Advanced Public Transit Systems (APTS). Mr. Vick is currently the product manager for MIST®, the Management Information System for Transportation, PB Farradyne's flagship software platform for ITS command and control. In this product manager role, he supervises and provides technical direction to a staff of several software and system engineers involved in the design, development, integration, and testing of MIST® implementations around the country.

Additionally, Mr. Vick served as the Principal Investigator for the recently completed "Transportation Management Systems: Maintenance Concepts & Plans" task order contract with the FHWA. As part of the TMC PFS, this task includes research into the state-of-the-practice for maintenance management programs. A synthesis of practice was developed through literature review and interviews with TMC operating agencies. The results of this

project were a set of guidelines for agencies to establish and fund ongoing maintenance management programs for ITS technology and other transportation management systems.

Joerg "Nu" Rosenbohm is PB Farradyne's key engineer for the preparation of initial (conceptual) designs and construction supervision for TOCs. Examples include the design of the Dallas, Texas, DalTrans TMC; the re-design of the PeopleMover Operations Center in Detroit, Michigan; the initial design and construction supervision of the Kentucky Statewide TOC; the initial design and construction supervision of the Nashville DOT TOC (new building); the redesign and expansion of the City of Phoenix TMC; the Calgary (Canada) TMC; the retrofit of the Syracuse, New York, TMC; the retrofit of the Albany, Georgia, TMC; the development of preliminary designs for the Prince George's County, Maryland, TMC; the Southern New Jersey TOC (new building); the Northern Virginia TOC (new building); the retrofit of the Massachusetts Highway Department Interim TOC; and the retrofit of the Incident Management Center (IMC) for Albany, New York.

Donald Correll has more than three decades of experience in the systems engineering field. He has extensive knowledge and skills with designing, installing, integrating, testing, and documenting equipment. Mr. Correll has an exemplary track record of completing tasks on time or ahead of schedule even when faced with the toughest barriers. As on-site engineer for the TransGuide system in San Antonio, Texas, Mr. Correll was responsible for integrating all the elements of the TransGuide system, including loop controllers, digital messaging system (DMS) signs, lane use signals, closed circuit television (CCTV) cameras, a SONET communications system, and a video switch. He configured a major portion of the field equipment and control center. As testing of the interface to the field equipment from the computer room progressed, it became evident that the design for the interface to the field equipment would not work. Mr. Correll then designed engineering changes that eliminated the problem. He prepared deliverable documents, including all the cabling diagrams, floor plans, and cable interface instructions for the entire TransGuide system. He also provided the system training documentation and training for the TransGuide System.

Mr. Correll served as the Project Manager/Design Engineer for the Site Utilization Secure Enhancement at the Merritt Island Launch Area Tracking Station in Cape Canaveral, Florida, and the Mini Network Operations Control Center to support the Department of Defense (DOD) Shuttle missions. Mr. Correll was responsible for the Command, Telemetry, and Range Safety Crypto installation and integration into the existing non-secure National Aeronautics and Space Administration (NASA) tracking station and Operations Control Center. In addition to this, Mr. Correll, was sent to White Sands, New Mexico, as a member of a team that assessed the vulnerabilities of the secure system for both Shuttle and Tracking Data Relay Satellite System missions. From this study, the team developed the engineering changes to the system to eliminate vulnerabilities and identified operational work-arounds to recover from any disaster that could occur at any of the NASA Secure facilities.

Robert Murphy offers 25 years of operational experience in communications and public relations as serves as PB Farradyne's operations manager for the West Palm Beach, Florida, TMC. Mr. Murphy has served in this role since July 2003 when the TMC opened, and was actively involved during evacuation and recovery operations with three of the four major hurricanes that hit Florida in 2004. Mr. Murphy will be interviewed as part of Task A.2 of this project.

Prior to joining PB, Mr. Murphy was a general manager and director of operations responsible for SmarTraveler Philadelphia, the five-year, $5.1 million audio-text and Internet traveler information service. The service provides route-specific information on 55 highway and mass transit segments in southeastern Pennsylvania and southwest New Jersey. SmarTraveler Philadelphia, operated by SmartRoute Systems of Cambridge, Massachusetts, was the only local traveler information service available continuously during the 9/11 national emergency. Mr. Murphy headed the SmartRoute Systems team that devised a plan to maintain remote data input from the New Jersey DOT facility after primary operations center was evacuated for safety concerns. Mr. Murphy received a citation, on behalf of SmartRoute Systems, in November 2001 from the Cross County Connection Traffic Management Advisor (TMA) for assisting in the dissemination of timely New York City area traveler information to all New Jersey TMAs.

Cliff Conklin has 10 years of experience successfully developing, implementing, and managing information technology system projects as part of multiagency and consultant teams and designing freeway management systems. As operations manager for the Tennessee DOT's Nashville Region 3 TMC, Mr. Conklin is responsible for overall operations, day-to-day management, and staff supervision including setting task assignments for operations staff. Mr. Conklin established the operating guidelines and is currently involved in the modification of policies and procedures following operational review. His duties also include staff training, presenting briefings or hosting meetings and tours, coordination with outside agencies at all levels of government, oversight and operating a variety of equipment and information systems to monitor, and evaluating and directing traffic operations for the specific geographic area covered by the TMC. Mr. Conklin's position requires management-level experience, expertise and skills in automation software and applications, staff supervision, scheduling, producing reports, development and administration of tours, and other duties as required. The program responsibilities include: congestion monitoring, incident management, traffic management, information management, and traffic information dissemination.

David Howell's background is in many different areas in ITS and transportation engineering. Currently, Mr. Howell serves as the project manager, operations manager, and systems engineer for the Capital Region TMC in Albany, New York. He is also the moderator of the PB Operations Discussion Group and is involved in developing policy for PB for TMC operations.

Mr. Howell served as the lead designer of ITS systems for the PB Farradyne Orlando office. He has been the designer of the I-4 Auxiliary Lanes Project in Orlando, the St. Johns River Bridge replacement project, the Cooper River Bridge project in South Carolina, the St. Louis ITS project in Missouri, and the Nashville ITS System in Tennessee. He was the first operations manager

for the I-4 Surveillance and Motorist Information System (SMIS) and the Daytona Area Smart Highways (DASH) projects in Florida.

Vijay Varadarajan is an assistant engineer with four years of experience in ITS, including system analysis and modeling. For the Pennsylvania Turnpike Commission (PTC), Mr. Varadarajan has served as ITS Engineer in support of a concept of operations, a web page prototype, systems integration management, database development, deployment documentation development, and baseline system deployment for the PTC's freeway management system. He was also the ITS Engineer supporting the development of regional ITS architectures in two regions – Pennsylvania DOT Districts 8 and 9. As the primary support for both these regions, Mr. Varadarajan is handling outreach to regional stakeholders, documentation of stakeholder input, assisting with the use of software tools such as Turbo, and preparing the architecture document and outputs.

Mr. Varadarajan has a strong background related to traffic signal system operations. He has analyzed the results and performed necessary modifications to the models to meet project requirements. He worked on the installation of the RT-TRACS system in Seattle RT-TRACS, City of Fort Collins, and in Vancouver, Washington. He was the task leader for the implementation of adaptive signal control algorithms, which include the Optimized Policies for Adaptive Control (OPAC) strategy and the Real-time Traffic Adaptive Control Logic (RTACL) algorithm. OPAC has been deployed at several locations throughout the United States, and RTACL, a new algorithm, was recently field tested in Chicago, Illinois. Mr. Varadarajan's experience also includes the field data collection, loading detector information in the database and database map editors for the RT-TRACS.

Susan Armstrong is the key assistant engineer supporting the integration and build-out of the KYTC TOC. Her experience includes design, procurement, and installation for increasing video sharing capabilities within the State Office Building and for video sharing between other facilities statewide. Ms. Armstrong has been a task manager for Computer-Aided Dispatch software deployment in the facility and worked on the plan and design for expanding video to include various bridges across the State.

Ms. Armstrong also possesses experience working on CCTV camera design, including field studies and installation oversight for a client-sensitive security-related project in Washington, D.C. Ms. Armstrong is also supporting a traffic signal system installation in Chesapeake, Virginia, providing hardware support through field visits and CCTV camera troubleshooting.

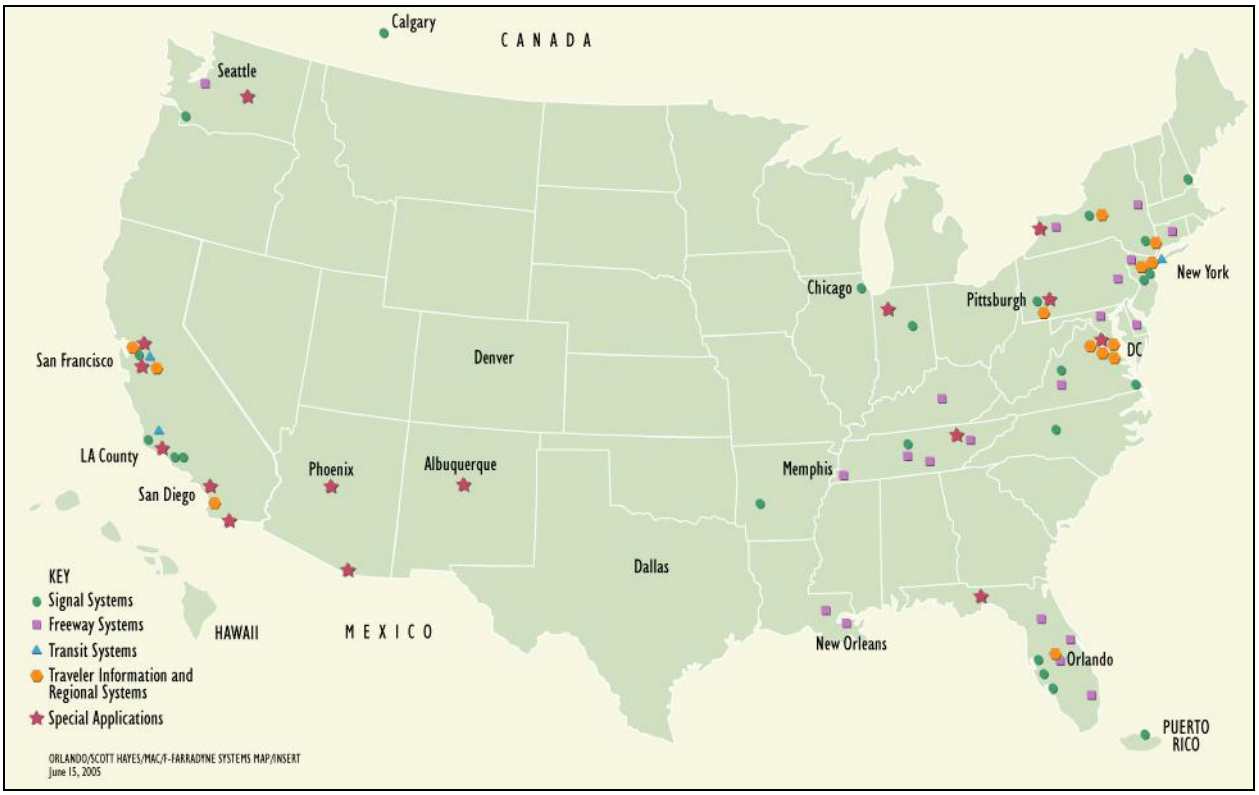
Past Performance

PB Farradyne is the ITS district of Parsons Brinckerhoff Quade & Douglas, Inc. PB Farradyne, founded in 1984, started as an ITS company applying technology and computing breakthroughs to transportation. Today, PB Farradyne employs almost 200 people, has total revenues approaching $50 million annually, and is widely recognized as one of the nation's leading

traffic management and travel information system integrators. PB Farradyne's continuing growth and involvement in state-of-the-art ITS developments clearly demonstrates our staying power as an industry leader. We are very proud of our record of having deployed 75+ traffic signal, freeway management, and travel information systems throughout the nation, as shown in Figure 1. Out of the 75+ ITS systems successfully completed by PB Farradyne, we have planned, designed, installed, integrated, and completed acceptance testing for 15 TMCs located in:

- Albany, New York
- Long Island, New York
- Bridgeport, Connecticut
- Northern New Jersey
- Southern New Jersey
- Frankfort, Kentucky
- Knoxville, Tennessee
- Nashville, Tennessee
- Ft. Myers, Florida
- Orlando, Florida
- West Palm Beach, Florida
- Baton Rouge, Louisiana
- Phoenix, Arizona
- San Francisco, California
- Calgary, Alberta

Figure 1. PB Farradyne Systems Installations

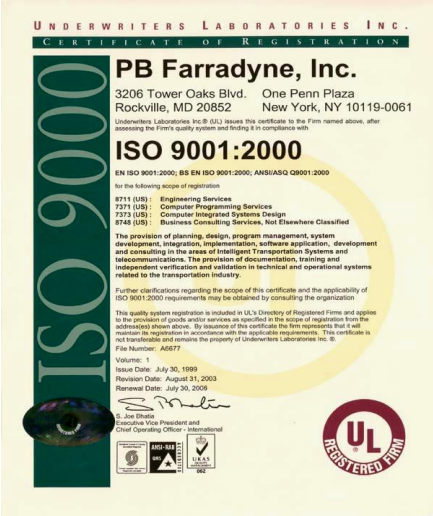


PB Farradyne's expertise extends through the full range of services related to advanced traffic management, travel information, public transportation, and electronic toll collection systems, including planning; control center, field device, and communications design; software development; system integration and testing; and system operation and management. Our system development and deployment experience includes traffic signal, freeway management, travel information, public safety, security, and statewide and regional information sharing systems. Few, if any, transportation system integrators can match the volume and quality of our experience in deploying more than 75 systems since our inception, including some of the world's most innovative and complex systems.

PB Farradyne's staff is its best asset. It consists of motivated and dedicated people who possess state-of-the-art knowledge and years of project experience in both the public and private sectors and in every discipline needed to develop ITS solutions to meet your challenges. We understand the challenges that our clients encounter because many of our managers have first-hand experience in dealing with public agency needs and institutional requirements. Our staff includes:

- Program and project managers
- Control center designers
- Communications engineers
- Field design engineers
- Systems analysts
- Software developers
- Quality assurance specialists
- Configuration management specialists
- Testing specialists
- System documentation and training specialists
- Transportation / Traffic signal engineers
- ITS policy analysts and system planners
- Incident management experts
- System operations and management personnel

The Underwriters Laboratory (UL) originally registered PB Farradyne as being compliant with ISO 9001 quality processes on July 30, 1999. On June 14, 2001, PB Farradyne was notified that we had been re-registered by the UL. In March 2003, we again passed an audit that allows us to retain our ISO 9001 registration, showing our continual commitment to quality. PB Farradyne successfully converted to the new ISO 9001:2000 Standard during the spring of 2003. In July 2003, PB Farradyne passed an audit and was registered in compliance with the new standard. This registration applies to the provision of planning, design, program management, subcontract management, software applications, consulting, computer programming, system integration, and system implementation services in the areas of ITS and telecommunications.


UNDERWRITERS LABORATORIES INC.
CERTIFICATE OF REGISTRATION
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ISO 9001:2000
EN ISO 9001:2000; BS EN ISO 9001:2000; ANSI/ASQ Q9001:2000
8711 (US) : Engineering Services
7371 (US) : Computer Programming Services
7373 (US) : Computer Integrated Systems Design
8748 (US) : Business Consulting Services, Not Elsewhere Classified
The provision of planning, design, program management, system development, integration, implementation, software application, development and consulting in the areas of Intelligent Transportation Systems and telecommunications. The provision of documentation, training and independent verification and validation in technical and operational systems related to the transportation industry.
Volume: 1
Issue Date: July 30, 1999
Revision Date: August 31, 2003
Renewal Date: July 30, 2006
S. Joe Bhatia
Executive Vice President and Chief Operating Officer - International
ISO 9000
REGISTERED FIRM

PB Farradyne's ISO 9001 compliant quality procedures are fully described in our Quality Manual and Quality Procedures documents. These documents are regularly used by our technical staff and cover the full range of project management and system development activities, including control of project scope, schedule, and budget; document control; design control; quality system records; records storage and retrieval; and employee training. PB Farradyne's software development processes achieved Carnegie-Mellon University's Software Engineering Institute's (SEI) Capability Maturity Model (CMM) Level II on our TravInfo® project. PB Farradyne is the only ITS integrator to be certified to the ISO 9001 Series Standards for quality.

Selected Representative Projects

Selected representative projects of relevance that cover a wide spectrum of TMC-related tasks to related to recovery and redundancy are summarized below.

Kentucky Statewide Transportation Operations Center – PB Farradyne was retained as the prime consultant for the KYTC to support the planning, design, and implementation of the statewide TOC in Frankfort, Kentucky. The TOC will interact and exchange data with four existing Regional Operations Control Centers (ROCC) in Cincinnati, Lexington, Louisville, and the Cumberland Gap Tunnel; however, the TOC will control and monitor existing and planned devices and oversee operations located in other areas outside of the ROCC jurisdictions. Additionally, it will serve as the main information exchange point for transportation-related information in the State. PB's responsibilities included:

- Complete the TOC preliminary design, including a technology architecture and development of preliminary equipment and design specifications;
- Complete the communications planning, including bandwidth requirements analysis and comparison of alternatives and final communications architecture design;
- Develop central system software requirements;
- Develop TOC technical documents;
- Installation, observation, and coordination of the TOC build-out;
- Develop operations and maintenance manuals, including a policies manual, performance criteria, and a standard operating procedures manual;

- Development of a staffing strategy;
- Complete acceptance testing;
- Provide cutover support;
- Preparing plans, specifications, and estimates for CCTV cameras and dynamic message signs; and
- Project management.

Recently, PB Farradyne has been tasked to expand the TOC to provide for the State's Fusion Center. The Fusion Center will be the focal point for collecting, reviewing, and acting upon security-related events in Kentucky. PB Farradyne recently completed the physical design of the Fusion Center, and is awaiting funding to complete its build-out.

Tennessee DOT SmartWay TMC – The Tennessee DOT SmartWay TMC is a comprehensive traffic and incident management system designed to address the traffic impacts of the I-65 North reconstruction in Davidson County. The Tennessee DOT and FHWA sponsor the project. The mission of the SmartWay system is to provide effective incident management and traveler information within the I-24, I-40, I-65, and I-440 corridors in Davidson County (metropolitan Nashville).

The SmartWay program deployed, operated, and maintained by the PB team links participating traffic operations, emergency operations, and transit agencies by real-time communications and provides travelers with real-time travel information. The project includes approximately 36 miles of Interstate and major state highways. The operation center contains four ITS workstations, two HELP Dispatch workstations, a 12 cube (52-inch cubes configured in a 4x3 pattern) Clarity rear-projection video wall, communications/server room, conference room, reception area, restrooms with showers, and a break room. A back-up electrical power system contains a one-hour uninterrupted power supply and a diesel powered electrical generator.

The PB team at SmartWay operations provides:

- Incident management (detection, verification, management, and notification) communication center for the Tennessee DOT, Region 3;
- Live web service for the public with 56 still camera images and DMS message list;
- Coordinate with the dispatchers of the Tennessee DOT HELP service patrol vehicles;
- Travel time messages on several DMS during the AM and PM peak periods;
- Incident text messaging service;

- Broadcast messages via Highway Advisory Radio (HAR) to inform motorists of incidents;
- Real-time electronic messaging on 17 DMS along interstates in Davidson County; and
- Quarterly and yearly statistics/output reports.

Louisiana Statewide ITS Deployment – PB was retained by the Louisiana Department of Transportation and Development (LaDOTD) to provide planning, design, and implementation services for the development and deployment of statewide ITS and development of a statewide ITS telecommunications plan. PB implemented its MIST® for sections of I-10 in Baton Rouge. The initial system deployment manages and controls radar detectors and CCTV cameras; later versions will incorporate control of dynamic message signs. PB will also develop an operations plan for the Baton Rouge Advanced Traffic Management–Emergency Operations Center (ATM-EOC). Over the length of the engagement, the team will create an ITS system that will be incrementally deployed statewide, yet with sufficient flexibility to satisfy local requirements. This system will be consistent with the Louisiana statewide and national ITS architectures. PB's ITS planning, design, and system implementation resources and expertise have enabled LaDOTD to respond quickly to the varying needs of different regions throughout the entire State.

Additionally, PB will develop a statewide ITS telecommunications plan, taking advantage of the fiber optic capacity made available to the LaDOTD as a result of providing right-of-way access to private telecommunications service providers. Several of the initial tasks involve field device and ITS design services. One task involves additional field device installations in Baton Rouge. Other tasks involve plans and designs for an interim traffic management system and design of a TMC for New Orleans, and development of ITS Implementation Plans for the Lafayette and Shreveport regions.

TravInfo® Contractor – The Metropolitan Transportation Commission (MTC) retained a team led by PB to design, build, operate, and maintain TravInfo®, an Advanced Traveler Information Systems (ATIS) for the San Francisco Bay Area. Our team collected and fused data from multiple sources including freeway sensors, CCTV, incident databases, California Highway Patrol, and public transit. PB Farradyne designed, developed, and implemented processes for data fusion and data dissemination methods including Internet and telephone. We also designed and constructed a traveler information center where systems are installed, operated, and maintained. Our scope also included designing and deploying user-friendly web site, interactive voice responsive systems, and telephone required for 511 telephone service including wireless carrier agreements.

The PB team currently provides 24/7 operations and maintenance of the TravInfo® Operations Center, which is co-located with the Caltrans TMC in Oakland. Our other deliverables to the MTC include program management, accounting, cash flow and financial management, software configuration management and control, quality assurance, security, and performance monitoring.

Nebraska Operations Center Design – After studying the various options available to implement a Statewide Traffic Operations concept, the Nebraska Department of Roads (NDOR) decided upon the use of District Operations Centers (DOC) in each of their eight districts across the State. Two of the DOCs are urban in nature, Omaha and Lincoln, while the remaining six are in rural areas of the State. NDOR selected the team of HWS and PB Farradyne to design the multiple DOCs and develop the functional requirements for the DOCs as well as the hardware and software to be used across the State. The tasks we are responsible for include:

- Development of a project management plan that includes schedules, quality control procedures, and other management procedures.
- Planning for the multiple DOCs across the State and the District 2 (Omaha) DOC. This includes the finalization of the Concept of Operations.
- Development of functional requirements for the District 2 DOC and the rural DOCs.
- Development of District 2 DOC Facility Design, District 2 ITS Functional Design, and DOCs.
- Development of rural DOCs Functional Design and Deployment Plan.
- Preparation of Software Functional Requirements for all of the DOCs.

AASHTO State DOT Emergency Response Handbook – PB supported AASHTO in preparing a handbook for state DOTs to use in developing and updating their roles, procedures, and capabilities for emergency response in conjunction with terrorist events. The guidance has two principal context focuses: first, it provides external process suggestions oriented to insuring that the state DOT is properly integrated with other key players such that its potential contribution is recognized; and second, it provides guidance for internal planning to insure that the department is capable and ready to play its appropriate role. Key project components included:

- Criteria for review of existing in-place plans and procedures with regard to responding to the appropriate range of terrorist scenarios;
- Standard “best practice” template of preparations, identifying key elements that may need to be addressed;
- Checklist approach for a user-based assessment of readiness;
- Examples; and
- Guidance for the estimation of capital and operating costs to develop and maintain the terrorism-related components of emergency response plans.

The handbook included specific recommendations relative to ITS applications and protection. The focus was on two types of scenarios.

- On highway incidents – Responses to incidents directly involving the highway infrastructure (such as explosive attacks on bridges or chemical attacks on tunnels). Emergency response to *on-highway*-related incidents is a well-developed field with a known state-of-threat and practice. However, the threat types associated with terrorism attacks that are part of the post-9/11 reality introduced the need to cope with an expanded matrix of incidents (e.g., chemical, biological) and new institutional players.

- Off-highway incidents – Responses to incidents involving off-highway assets in which the highway system plays a key role (such as evacuation or special access). Emergency response related to *off-highway* events focuses on highway functionality for evacuation, quarantining, or special access for both general areawide incidents (e.g., hurricanes, floods) and for potentially vulnerable or dangerous installations (e.g., military, nuclear power plants). This work was carried out in conjunction with the AASHTO Task Force on Transportation Security and included liaison with the FHWA and Federal security-related entities.

Emergency Transportation Operations Preparedness and Response Workshops for Statewide Applications – AASHTO, through its Transportation Security Task Force, and the National Cooperative Highway Research Program (NCHRP), as the contracting agency, supported workshops of up to 60 participants in four states to determine the readiness of their state emergency management plans and preparation to address terrorist incidents with statewide consequence, with a particular emphasis on introducing and clarifying the role of the state DOTs within the state emergency management context. The four states were Minnesota, New Mexico, Idaho, and Washington. One of the documents that underpinned the workshops was *A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents*, also developed by PB.

In conducting these workshops, it was necessary to work closely with the state DOTs in the following ways:

- Close and frequent coordination on both workshop substance and logistics;
- Provision of information to form the basis for the workshops;
- Assistance in planning consultant team visits for workshop planning;
- Coordination with other state and possibly Federal and local agencies;
- Building interest in the workshops to ensure participation of key players;
- State resource support for logistical items; and
- Ensuring top-level commitment and support.

PB was responsible for the following: gathering relevant information from the states and elsewhere; using the information gathered to develop workshops useful to the states, including a tabletop exercise; providing camera-ready technical content for the workshops; working with the states to develop the agenda and program; leading and facilitating technical and program

discussions within the workshops; documenting issues, lessons learned, participant recommendations, and follow-up tasks for workshop participants by using information from state-supplied recorders, consultant notes, and other sources; reviewing the evaluation forms and other feedback to improve subsequent workshops, both in technical content and logistics or process; and drafting a final report covering all four workshops, which included recommendations on ITS and protecting it. As part of planning the tabletop exercises, consideration as to the types of attacks that state DOTs would face was incorporated. In several scenarios, ITS was considered for its vulnerabilities and the need to protect it.

TRANSCOM Regional Architecture Web Interface – The TRANSCOM Regional Architecture is a widearea network (WAN) of more than 50 workstations in transportation centers in more than 20 agencies in the New York metropolitan area. PB is in the process of upgrading the system to make it accessible to users via the Internet. As part of this effort, PB also is upgrading the disaster recovery aspects of the system. PB's approach to disaster recovery uses two basic forms:

- Server Hardware – Use of servers that include error-correcting memory, dual processors, RAID hard drive configuration, and redundant power supplies; and

- Automatic Failover Solution – Through the use of high-availability servers mirroring the SQL database and application servers at the local location as well as to a remote server location connected via a dedicated communications link.

The server hardware solution relies on the use of current server technology and is being handled at the time of equipment purchase through specification of the desired equipment. There are multiple mirrored server pairs providing high-availability services for web applications and SQL databases located at the primary location. Additional implementation of servers located at a remote facility will utilize replication services to provide continued operations from the remote facility if the primary facility becomes inoperable. The primary location is at TRANSCOM and the remote location is being selected by TRANSCOM based on the availability of a communication link to the remote location.

The primary web and SQL servers at TRANSCOM are being mirrored and clustered to another set of back-up servers at the same location for mission-critical up-time support. A second set of servers can be located at the remote site for catastrophic failure recovery. The Co-Standby Server process installed on each server will discover server failures and transfer control to the back-up server. Because of the IP clustering technology, the failover process will be transparent for the web users and the other servers. A Legato replication process is being used to synchronize dynamic and static data on both servers.

The synchronization process between both sites is being ensured by a data link connection installed by TRANSCOM for the SQL database servers only. The web and application servers have static information only. In the event of a catastrophic failure, the ISP would need to change / modify the DNS for the URL to the new location.

Delaware DOT Transportation Security Plan – PB worked with the Delaware DOT to prepare a Transportation Security Plan for Delaware. As part of this project, PB conducted a vulnerability assessment for critical transportation assets, and worked with a working group to identify consequences and countermeasures. The final plan included a prioritized list of capital improvements and policy/procedure changes and both short- and long-term capital improvement programs. In addition, PB provided training to department personnel on conducting vulnerability assessments, allowing the department to maintain and update the program internally in the future. As part of the vulnerability assessment, possible attack scenarios against Delaware DOT assets were considered. In addition, a specific task covered identifying ITS system vulnerabilities and countermeasures to defend against those vulnerabilities.

Regional Bank Disaster Recovery – Prior to joining PB, Mr. Iserson, our technical advisor, managed the preparation and quarterly testing of a regional bank's disaster recovery plan. The plan included re-positioning computer and systems to an alternative hot site, repositioning data lines for ATMs and teller terminals to the hot site, and transporting personnel and data to the hot site. The operational plan was documented to the level that non-company personnel could execute a restore. The plan and tests were audited and/or reviewed by Federal audit staff. Mr. Iserson also served as a member of a disaster recovery team for a large metropolitan bank. The team successfully repositioned all systems and on-line devices to a hot site during an actual emergency.

FEMA Disaster Response Services Technical Assistance Contract – Under a five-year standby technical assistance contract, PB provided technical services to the Federal Emergency Management Agency (FEMA) Infrastructure Support Division of the Response and Recovery Directorate and three of its regions. PB deployed a diverse staff – from architects and archaeologists to engineers and construction inspectors – to perform services covering damage and repair analyses of public and non-profit privately owned facilities following events such as urban fires, floods, earthquakes, and hurricanes.

PB was expected to respond within 48 hours of any disaster, and provide up to 70 persons for two months, 50 persons for six months, and senior-level personnel as necessary. The contract encompassed the states of Washington, Oregon, California, Nevada, Arizona, Idaho, Montana, Wyoming, Utah, Colorado, North Dakota, South Dakota, Alaska, and Hawaii; the Pacific territories of Guam and American Samoa; and the trust territories of the Pacific. Natural disasters included earthquakes and typhoons. As part of this contract, PB provided personnel to FEMA to assess flood damage throughout California, which was devastated by severe storms in the winter of 1995-1996, and surveyed the damage caused by the January 1994 Northridge earthquake.

Cost

Itemized budgets for the work we are proposing under this Task Order can be found in Attachment A. This information is prepared in accordance with the cost data and procedures proposed for Contract No. DTFH61-01-C-00181. The total estimated cost for this effort is $250,000.

Conflict of Interest

Cambridge Systematics respectfully submits that our team does not have a conflict of interest relating to work under this Task Order. We will proactively manage the issue of conflict of interest. Appropriate action will be taken to assure that no conflicts of interest arise.

Summary

The Cambridge Systematics team looks forward to the opportunity to support the FHWA on this very important project. Please contact Dr. William Perez or me at (301) 347-0100 if you have any questions or require additional information.

Sincerely,

CAMBRIDGE SYSTEMATICS, INC.

Arlee T. Reno
Senior Vice President

ATR / jai / 2567

Attachment

cc: Barbara McClary
Raj Ghaman
Carl Rodriguez